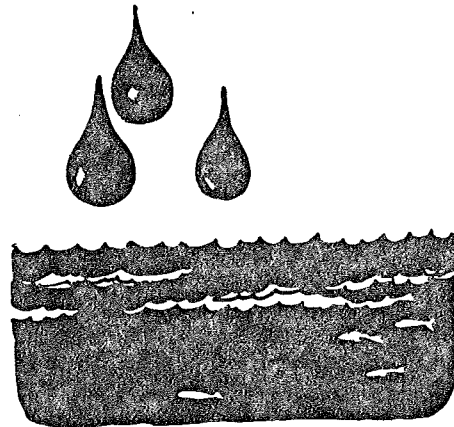
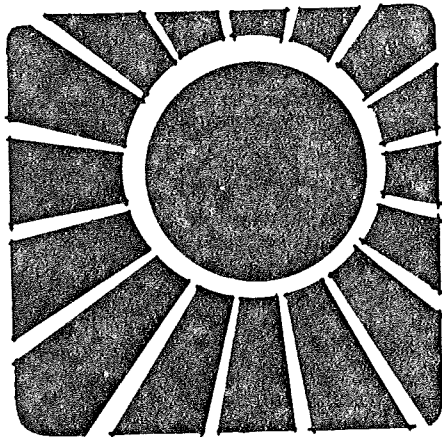


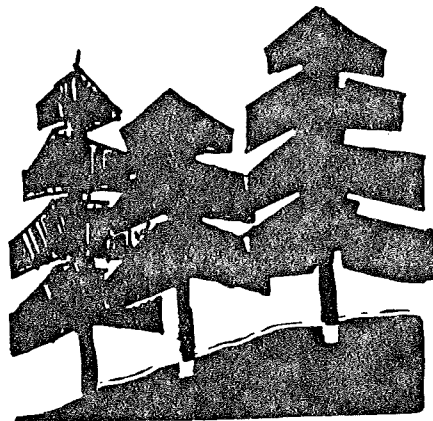
City Light

ENERGY CONSERVATION

Grant Proposals from the City of Seattle



Gordon Vickery, Superintendent



FEDERAL ASSISTANCE ENERGY PACKAGE

INTRODUCTION

Federal Energy Grant Application Package

City of Seattle, Washington

The City of Seattle's commitment to a forward-looking energy policy both culminated in and commenced with its "Energy 1990" study and decision. After months of research, meetings and debates involving public officials and private citizens, Seattle government adopted a bold new course of action to meet the energy shortage: it chose a conservation strategy over investment in two regional nuclear-generating facilities. That was mid-1976.

Now, as it strives to plan and develop specific programs for implementing this basic policy, the City is seeking Federal assistance to test some of its most progressive strategies that could have significant impact within its own locale and nationally, as well. Seattle is in a unique position to achieve important, meaningful results.

To begin with, it owns and operates the nation's second largest municipal electric utility. This utility has established an Energy Conservation Office with a staff of 8. This office reports directly to the Superintendent of Lighting and manages and monitors 24 separate conservation programs, focusing on the conservation of electricity.

But the City has not limited its conservation focus to electricity only. The Mayor and City Council have established a City Energy Office. This unit, reporting directly to the Mayor, concentrates on conservation of all energy resources and works within municipal operations, as well as with all levels of government--county, state and federal. The Seattle Energy Office provides a focal point for involving the private sector with City energy policies and programs. Additional staff support for implementing and monitoring Seattle's energy policy and programs is provided by its Office of Policy Planning, Office of Management and Budget and Office of Intergovernmental Relations.

This dedication of municipal resources to fresh approaches in local energy policy reflects the serious commitment of Seattle's political leaders. The Mayor and City Council, however, are constrained by increasingly scarce resources and, therefore, are searching for federal assistance to help fuel the innovative projects it has planned but which are presently impeded by limited funds.

The assistance proposals in the following pages are balanced in the aggregate. They grew out of a needs assessment by Seattle staff and include generation proposals, as well as conservation projects, for application in the industrial, commercial and residential sectors. Proposals to test consumer attitudes and provide a high public impact energy resources conservation center round out the application package. Each offers demonstration value for local governments and utilities across the United States.

Each proposal offers study and demonstration value for local governments

and utilities across the United States. Each offers the promise for new direction as the American people seek new answers to providing for a standard of living within the energy limitations.

ENERGY GRANTS PROPOSAL

Proposal Title

Energy Generation, In-Stream Hydroelectric Turbine

Summary

The Pacific Northwest region is noted for its predominance of hydro generation; however, the potential sites for new hydro facilities are limited since nearly all sites have been exploited and those remaining are marginal or cannot be built because of environmental constraints. The in-stream hydroelectric turbine concept would be able to make use of the vast river systems with minimal environmental impact. Established hydroelectric turbine technologies are available to make such units, and such a system would not require a dam. The in-stream hydroelectric turbine generator would operate by river flow and would be submerged in the river in locations so as not to impede river navigation. A string of such turbines could be easily connected to a central power facility for the distribution of the electricity. Preliminary investigations indicate that such a system would provide significant amounts of energy in the Northwest, especially in the larger river systems.

A ten-foot-diameter ducted in-stream hydroelectric turbine as shown in Figure 1, operating between streamflows of 6 to 8 miles per hour, could generate 40 to 100 kilowatts of electricity, more or less, constantly during the year. It is estimated that each in-stream turbine of this size and capacity could generate between 350,000 and 876,000 kilowatt-hours per year. If only 1,000 of these units could be installed in the river systems, between 350,000,000 and 876,000,000 kilowatt-hours could be produced per year.

Proposal Plan

A demonstration program would be implemented to test the concept of the in-stream hydro turbine in the Skagit River along an existing river system in an area near one of Seattle City Light's hydroelectric dams. It is proposed that a small test turbine of eight-foot-diameter size be built and tested.

A prototype model would be designed and built by one of the major hydroelectric suppliers of water turbines. It is estimated that the prototype design would take one year to build and that unit installed on site and generating after two months of initial testing. The testing program would be over a two-year period and the results published in a report which will include the performance of the unit, the maintenance and operational problems encountered and other operational aspects of the unit, as well as the economic feasibility of the system.

Cost Breakdown for the Program

The cost for a prototype unit with a generating capacity of 50 kilowatts at a design steam-flow of 7 miles per hour.....	\$120,000
The cost for installing the unit in the river and connection of transmission.....	5,000
The cost for instrumentation and monitoring.....	15,000
The cost for engineering and supervision.....	10,000
Reports, studies and papers.....	10,000
Total.....	\$160,000

Utilization

The program would run over a three-year period and, if results from the prototype looked promising, further investigative work would be undertaken to determine the scaling required to design larger units. At the same time a study would be made to identify those river systems in the Pacific Northwest suited to the in-stream hydroelectric turbine system.

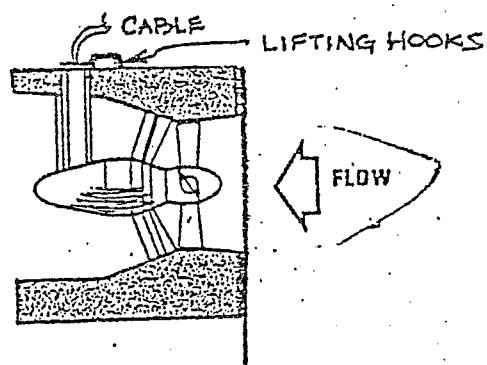
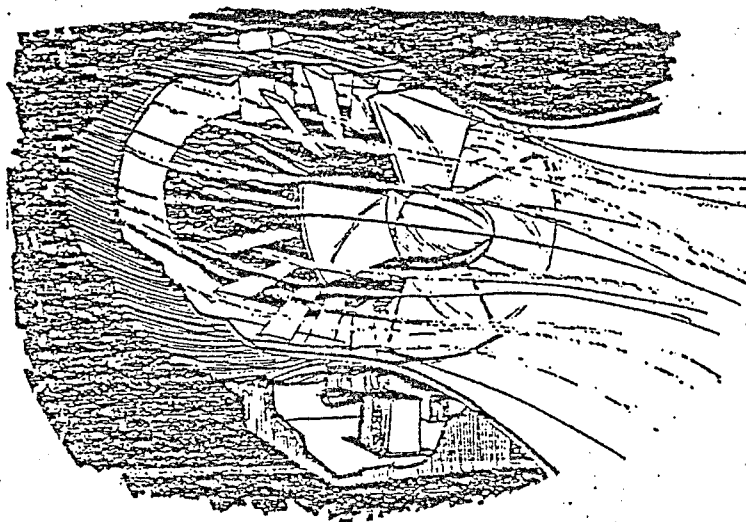


FIG 1

IN - STREAM HYDRO

ENERGY GRANTS PROPOSAL

Proposal Title

Wind Energy Assessment Program

Summary

A wind monitoring program would establish the wind potential and most promising wind sites for future wind turbine generation in a region of the Pacific Northwest. A total of 12 wind monitoring stations would be set up in the Pacific Northwest in areas not currently being monitored. The program would be evaluated over a two-year period and a technical study made for each site, establishing the wind potentials at each site and how existing wind turbines might be integrated into Seattle City Light's utility grid or hydroelectric system.

Problem Statement and Objectives

All national studies of the potential of wind indicate the Pacific Northwest as one of the most promising wind areas in the country; however, little practical meteorological data exists by which to make valid assessments of potential windy sites. A wind energy assessment program will provide Seattle City Light information necessary to make future decisions regarding the use of wind energy as an alternative generating source.

Proposal Plan

A wind prospecting and wind monitoring program would seek out the most promising wind sites in the Pacific Northwest area. Four general areas to be prospected are: the Seattle vicinity, the Skagit River, Boundary Dam area, and the Washington coast.

It is planned to set up 12 monitoring stations for preliminary investigations of wind conditions in these areas. Ten of these monitoring stations would be of very inexpensive design, comprising an anemometer generator electronically integrated into a series of digital counters operated by batteries to provide gross readings of the monthly total of wind energy. The counters would record data over a six-month period. The remaining two monitoring stations would make use of existing City Light portable MRI monitoring stations, which utilize a battery-operated recording system to monitor wind speeds, direction, and temperature. Each monitoring station would remain in place for a year, after which time the data from these sites would be analyzed and the stations moved to other sites.

It is estimated that the total funding for this project would be \$25,000.

Cost to rebuild two MRI units currently owned by City Light.....	\$ 700
Cost to develop an inexpensive monitoring station.....	2,000
Cost to build ten inexpensive monitoring stations.....	8,000
Cost to install monitoring station at sites (man-hours and transportation).....	6,000
Cost to maintain and service units (man-hours and transportation).....	2,000
Cost to retrieve data at each site.....	4,000
Cost for final report.....	3,000
Total.....	\$25,000

Utilization

The project will provide technical information that documents the wind energy data at specific locations in the Pacific Northwest that could be utilized in the future assessment of wind turbines for generating electricity by Seattle City Light. Such a program would provide City Light the necessary information to make future decisions regarding wind turbine generation. In addition, the data obtained on this project would provide information that would be valuable in the national program to identify potential wind sites within the continental United States.

If several promising sites are identified, a follow-on program would include optional testing of small scale wind machines, such as the Darrieus rotor or conventional wind turbines, at one or more of these sites.

ENERGY GRANTS PROPOSAL

Proposal Title

Energy Generation, Use of Bioconversion

Summary

A national program is currently underway to determine the possibilities of growing plant materials or using residues for energy production. Such a program will provide funds for energy plantation experiments to be set up in various regions throughout the country. Before an assessment could be made of the value of energy plantations in the Pacific Northwest, identification must first be made of fast-growing species of trees that would be harvested in a fast rotation sequence to be used in direct combustion or conversion for the production of electricity. At this time the end use technology is better understood and established than is the silvicultural knowledge necessary to optimize plant mass production for energy purposes.

Proposal Plan

An energy plantation test project would be developed to optimize silvicultural management techniques to determine energy production as it relates to future generation options for the City of Seattle. Four to six test sites would be chosen where fast-growing, coppicing trees (trees that resprout from roots), such as red alder, would be planted at various spacings and treated to varying rotational periods. Two possible test sites include an existing surface reforestation project at the Centralia coal-fired plant in Centralia, Washington, and deforested land on the Seattle watersheds.

A second study would investigate the land inventory, in order to determine possible future sites for energy plantations. Such a study would have to include distance from existing or proposed energy-conversion facilities; competing land uses, such as timber production and food production; and industrial barriers to possible use for energy production. Such a land inventory might include the Seattle City Light right of way under power lines.

Utilization

To implement the project, contracts would be given to the University of Washington or the Washington State University Forestry Department to develop test plots at Centralia, the City of Seattle watershed or other designated areas. The project would continue for at least five years, after which time a report on the results of the experiment would be published. At the same time, if the results prove favorable, City Light would initiate proposed plans for implementing an energy plantation proposal to be submitted to the City Council as an alternative energy generation scheme.

ENERGY GRANTS PROPOSAL

Proposal Title

Hourly Load Prediction System (HLPS)

Summary

HLPS is a project that will enable utilities to generate the same amount of electricity with less fuel by running their generators more efficiently (see Explanation below). Seattle City Light is a good utility to do a prototype study because its compact service area will keep costs down, but HLPS can be applied to produce fuel savings anywhere in the country.

Explanation

All major electricity generating plants, whether hydroelectric, fossil fuel, or nuclear, are most efficient when operating near 100% of capacity. Efficiency drops off rapidly when they are operated below 50% of capacity. Thus an electric utility will get the most out of its fuel if it can run as few generators as are necessary to meet its load at any time. For example, if a utility has a load of 270 MW, and has four 100 MW generators, it would conserve fuel if it ran three generators at 90% capacity rather than four generators at 67.5% capacity. However, since loads change continuously and sometimes dramatically (in response to time of day, weather, and other factors), operating in this way can be dangerous. In the above example, if the utility's load suddenly jumped to 310 MW, and if it took an hour to start up the fourth generator, the utility could suffer a brown-out. Thus a utility's ability to conserve fuel in this way depends on its ability to predict its loads a few hours in advance.

Currently Seattle City Light has a load prediction system that operates on a day-to-day basis. Though this system has produced useable results for many purposes, it is hampered by its dependence upon daily weather data (available only on the next day) from a single observation station that is not in City Light's service area. The Hourly Load Prediction System (HLPS) is designed to remedy these deficiencies and produce an hour-by-hour load forecast for the next 6 to 12 hours that will enable City Light to conserve fuel (in this case, water) as described above.

Proposal Plan

Three weather stations will be set up to monitor weather in North, Central, and South Seattle. Data from these stations will be automatically sent each hour to a computer located in the City Light Building. The computer will also be continually receiving data regarding actual Seattle load, industrial shutdowns or start-ups, and short-range weather forecasts. The computer will output, on demand, a 6 to 12 hour forecast of future Seattle load. These forecasts will be relayed to the power dispatchers, who will use them in regulating Seattle's power plants.

Estimated Costs

Design and other paperwork	\$10,000
Weather station hardware	50,000
Data processing hardware	50,000
Data processing software	20,000
Communications hardware	20,000
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Total	\$150,000

Utilization

HLPS will be a prototype that will provide a good indication of the amount of fuel savings to be expected from widespread use of this conservation method. The savings may well be greater for other utilities than for Seattle, since most utilities, unlike Seattle, depend on thermal plants. Thermal plants are much less efficient when operated below capacity than are hydroelectric plants.

By allowing more accuracy in weather-load correlations, HLPS will also be of great aid in monitoring the effectiveness of other City Light conservation projects.

SEATTLE FIRE DEPARTMENT ENERGY-EFFICIENCY
RETROFIT STUDY AND DEMONSTRATION PROJECT
PROPOSAL

Summary

This study would examine Seattle's fire stations, their structures and personnel operations to identify wasteful energy consumptions due to poor structural design, to careless or improper use of equipment and to use of equipment that is energy-wasteful per se. Having identified energy-wasteful problems, the study would research and propose corrective measures. A second phase would construct and implement the recommended measures of the study. A third phase would evaluate the energy savings derived from the first two phases and develop a report to be circulated nationally on how fire stations can be retrofitted to save energy.

Problem Statement and Objectives

Fire stations are single-purpose public structures that exist in all parts of the United States. Seattle's 35 stations vary in age and size; but a common denominator among each is the fact that none were designed from an energy-efficiency point of view, nor have the operations of fire personnel been organized with energy-efficiency values in mind. The result is that fire stations in Seattle waste and consume high quantities of energy--electricity, heating oil and natural gas. An assumption inherent in fire department operations is that all resources will be used in the furtherance of the departmental mission.

The primary objective of this proposal's first phase is twofold: (1) to identify those structural features in the Seattle fire stations that are conducive to the waste or high rate consumption of energy and recommend solutions for eliminating the energy waste and reducing each feature's energy-consumption rate (e.g., multistory firehouses have pole holes cut through each floor so fire personnel may quickly respond to alarms by sliding down the poles. These circular cuts in each floor allow updrafts that suck heat from lower to top levels--especially if the apparatus doors are open or are not weather-stripped, as most are not); (2) to identify those personnel operations or work habits that are energy wasteful and to devise new operational methods for work practices that do not waste or consume high amounts of energy (e.g., use of electric hose dryers instead of open air hose towers for drying).

Other specific design features to be examined would include the need for airtight/weather-stripped doors, the need for automatic door-closing devices for the times when apparatus leave to answer an alarm, the need for storm windows and the proper factors for insulation in firehouse walls and ceilings, the practicality of automatic thermostats for turning off heating/cooling systems when fire personnel are either asleep or away from the station, the need to

lower the high ceilings of old firehouses to reduce heat loss, and to observe and critique all fire personnel job routines for the purpose of identifying wasteful habits that can be corrected to save energy.

Proposal Plan

Identification of energy-wasteful design flaws in fire stations, in types and use of equipment, and of energy-wasteful work habits of fire personnel would be done by professionals making inspections and by instrumental monitoring of energy waste in each station. A consultant with architectural, engineering and personnel (public safety) management capabilities will be sought to conduct the study.

The estimated cost for the 6-9 month study is \$50,000-\$75,000:

Personnel cost	\$40,000-\$50,000
Equipment and Supplies	\$10,000-\$25,000

The study, phase one of the project, will ascertain the extent of the energy-waste problems and recommend appropriate solutions, including a cost estimate of what would be required to pay for construction and implementation of the recommended solutions.

If phase one indicates substantial energy/cost savings can be achieved by design corrections, installation of energy-saving devices and materials, and implementation of new work procedures, then a grant to fund phase two (the construction and implementation phase) and phase three (for evaluation) would be sought.

Utilization

The major element of phase three would be to describe the results of the project in Seattle as it would apply to fire stations across the nation. The information would provide a base line both in terms of describing problems and in describing practical solutions. Since fire stations are manned 24 hours a day, even a 20 percent reduction in their energy consumption would be a significant amount for Seattle--especially if similar savings could be realized nationally.

GENERATION, TRANSMISSION, & TRANSFORMATION

Waste Heat Reclamation

(Utilizing waste heat from electric substations or site-located transformers)

Substantial heat is produced during the transformation of electricity from high voltage to usable levels for neighborhoods or large customers, such as office buildings, etc. Reclaimed heat at a substation could be used to drive bottom cycling engines to generate electricity. It also could be made available to adjoining residences for space heating purposes, possibly serving as a mitigator of localized impact of substation location in residential areas. Bottom cycling is state-of-the-art and capital intensive. Utilizing low-grade waste heat for low-grade space heating purposes would appear to be more cost justified, even though it would only be utilized during part of the year.

Design and location of transformer vaults serving buildings requiring space conditioning could offer substantial improvements in energy utilization in terms of final transformation and end utilization of electricity. Specifically, heat absorption loops or air ventilation and ducting could be designed to utilize transformer heat for space-conditioning purposes. Proper health and safety considerations would be required during design and demonstration.

ENERGY GRANTS PROPOSAL

Proposal Title

Solar-Assisted Hot Water Demonstration Program for the Seattle Area

Summary

The Seattle area has been identified as a poor region to utilize the sun's energy for space-heating applications, and such systems do not presently appear to be cost effective. Solar-assisted hot water systems, however, can utilize solar heat all year round for preheating domestic hot water and, therefore, the payback for such systems appears to be much sooner than for solar space heating.

Objectives

Data from such a program would determine the amount of solar energy available for hot water heating on a typical residential installation, the amount of the yearly energy savings, reliability and maintainability of such systems and life cycle costs.

If the program is successful, a program would be established to stimulate interest of local contractors and manufacturers into the making of solar-assisted hot water heating equipment.

It is estimated that from 15 to 25 megawatts of energy could be conserved by 1990, assuming a 60% saturation of solar-assisted hot water heating equipment in the Seattle area.

Proposal Plan

A demonstration program would be implemented to test the impact of solar-assisted hot water heating systems in the Seattle area. A procedure would be developed to select a group of 25 test homes that would use several different types of commercially available solar hot water heating systems. Fifteen of the installations would be completed totally by a building contractor and the remaining 10 would be installed by those homeowners using commercially available kits.

These homes would be monitored over a two-year period and the findings published in a report, along with plans and a listing of commercially available solar hot water heating equipment or kits. It is estimated that the total project cost would be \$50,000. To participate in this program, it is expected that the homeowner should be willing to help subsidize the program. Those having an installation completely installed by a contractor would pay \$600 and those installing the system by themselves would pay \$300.

Cost Breakdown for the Program

Cost of 25 solar-assisted hot water heating systems.....	\$25,000
Cost for contractor to install 15 solar hot water heating systems.....	12,000
Instrumentation and monitoring.....	10,000
<u>Reports and papers.....</u>	<u>3,000</u>

Total..... \$50,000

The total amount of contribution from the homeowner would amount to \$12,000.

The total cost of installation without including the subsidy.....	\$50,000
<u>Homeowner subsidy.....</u>	<u>-12,000</u>

Net amount of funding required \$38,000

Utilization

The program would last two years, after which time a report would be completed summarizing the results of the program and the economic feasibility of the systems tested, including recommendations as to the type of equipment that would be more suited to this area, if the equipment were made available to the homeowner.

If the results from this program show definite economic merits of solar-assisted hot water heating in the Seattle area, a program would be established using a customer advisory service group to prepare a handbook describing such systems, where they are available, and contractors and suppliers specializing in this kind of work.

ENERGY GRANTS PROPOSAL: NEIGHBORHOOD PILOT PROGRAM ON INSULATION/
WEATHERIZATION AND ENERGY CONSERVATION PRACTICES

Summary

The purpose of this program is to thoroughly test the value of citizen-based activity for insulation/weatherization and conservation practices as a method for reducing energy waste. The intent is to ascertain whether the program is worthy of substantial investment as part of the City of Seattle's energy conservation obligation.

Two to three Seattle neighborhoods will be chosen as pilot neighborhoods to receive an intensive, coordinated, self-help campaign. Emphasis will be on single-family residences; but small commercial establishments, churches and other neighborhood centers will be included as well. Financial assistance, energy audit expertise, training and organization, and information about insulation and weatherization materials will be focused on these pilot neighborhoods to eliminate energy waste. The goal is for a significant percentage of homes and other buildings to be physically insulated and weatherized, with occupants knowledgeable about and practicing ways to conserve energy. Monitoring will be a significant part of this program so that tested approaches and methods for conversion to energy efficiency in this program can be applied city-wide or expanded to other areas of the state and country.

Problem Statement and Objectives

Due to the low cost in the past of all forms of energy, and especially of electricity, most Seattle-area buildings are not well insulated or weatherized. The result is considerable energy waste from single- and multiple-family residences, from commercial establishments and other buildings. The Seattle area has a residential and a business population largely unaccustomed to energy conservation habits. This proposal will coordinate publicity, technical expertise, materials information, and financial assistance through an organized, aggressive, self-help program. It will develop and implement methods to obtain insulation and weatherization of homes and other buildings and to change awareness in personal practices to more efficient and knowledgeable use of energy.

The proposal will specifically answer the following questions:

1. What are the best means for determining current energy waste?
2. What type of neighborhood organization will produce concrete results, i.e., a significant percentage of energy efficient buildings and practices?
3. What are the best means for coordinating all of the programs? (Public and private loan assistance, materials information, training in how-to-do-it assistance, energy audit expertise, etc.) in focusing this information on pilot program areas?

4. What kind of monitoring programs will give the best evidence of program results?

Proposal Plan

What will be done? When fully underway, this program will be administered by a project director and assisted by six community organizers, four home service technicians, one data coordinator and two clerical staff. The program will be conducted for three years in three phases of approximately one year each:

- a. Program design, data collection, an initial implementation;
- b. Program implementation and improvement;
- c. Program implementation, evaluation and recommendations.

The program will offer both primary service to pilot areas and advisory service to nonpilot areas.

The first phase will consist of setting up and training staff, selecting pilot neighborhoods, and planning and initiating the work program for the primary service pilot areas. Methods to determine current energy waste will be assessed, such as: thermographic flyover information currently available at Seattle City Light, hand-held infrared camera, electric and fuel bill audit, insulation audits, building owner energy habits self-questionnaire, etc.

The primary service of this program will consist of organization of neighborhoods by census tract and by subblock-sized units of ten to twelve homes. The actual work of this program will take place in these latter small subblock-sized units. Each block will elect a block captain, hold informational meetings, schedule energy audits, coordinate technical assistance in insulation/weatherization implementation, and conduct monitoring and evaluation.

Community organizers will set up the block-unit structure and coordinate the audits, assistance, monitoring, etc. Home service technicians will assist on location in providing initial information, scheduling and administering audits, assisting in obtaining wholesale insulation supplies, and in conducting the program monitoring.

The second phase of the program will consist of program implementation and improvement. In addition, drawing from the methods developed during the initial stage of primary service, an advisory service will be set up to meet needs of those neighborhoods outside the pilot programs on a more self-help basis. Home service technicians will provide information on materials, with block area residents carrying out their own organization, audits, self-help, etc.

The third phase of the program will perfect previously developed methods and conduct a thorough audit of results of the program. Recommendations for further action will be given.

The estimated total annual cost of this program is \$250,000. The breakdown is attached.

Related Work

The City of Seattle has a plethora of energy conservation information and how-to-do-it assistance from the Federal, County and City governments and from the private sector. Everyone is "into" the energy-saving act, offering advice, tips, clinics and even financial assistance to certain groups. To date, no organization has brought together available knowledge and assistance into a systematic and organized attempt to achieve implementation by a significant sector of the community.

It is appropriate for the City of Seattle to take on this role for several reasons. First, the City has adopted an official policy of energy conservation with specific short- and long-term goals. Second, Seattle is a city with strong neighborhood identity and citizen involvement. Third, the City has considerable experience in program implementation on a neighborhood basis. Fourth, the City has developed neighborhood organization in program implementation to an impressive degree in its crime prevention "block-watch program." This program has recently received national recognition for its high percentage of program implementation—40%, as compared to other programs across the country with 10%. This energy conservation proposal draws heavily from the experiences and methods developed in this block-watch program and applies them to achieving neighborhood implementation of insulation/weatherization and energy conservation habits. This proposal would carry neighborhood program organizations further than has other City programs by treating a neighborhood as an organic whole. Not only would homes and multiple dwellings be involved; but commercial establishments, schools, libraries and community centers would be part of this program. Finally, Seattle City Light, the City's publicly-owned electric utility, has considerable recent experience in diagnosing heat loss, conducting energy audits and monitoring energy conservation measures. This proposal will utilize the technical experience gained at City Light for the direct implementation and benefit of Seattle city residents.

Utilization

Successful completion of this proposal would result in:

1. A significant percentage of two to three pilot neighborhood areas weatherized and insulated, with individuals involved in practicing energy conservation habits.

2. Proven, systematic, methods for successful implementation that can be adopted by others here in this City and across the country.
3. Advisory neighborhoods that have implemented programs on their own.
4. Data on implementation and maintenance of energy conservation practices to assist in successful implementation of other energy conservation programs and to enable the City to assess whether its 1990 energy conservation goal can be realistically attained.

Proposed Budget

Personal services (salaries, benefits)	\$227,000
Supplies	1,000
Equipment and rent	6,500
Other services and charges	15,500

ENERGY GRANTS PROPOSAL

Proposal Title

Energy and Resources Conservation Information Center

Summary

The purpose of this proposal is to evaluate a participatory, "hands-on" approach to an Energy Resources Conservation Center. The intent is to determine the effectiveness of this approach for investment in energy information centers by other areas of the country. The Center will present energy and resources information in a manner to inform and involve the public and to give them immediate and timely access to practical application of the learning experience to their own life situations.

The Energy Center will emphasize basic information about energy and resources conservation in two areas:

1. An exhibit area of informational displays with emphasis on active, "hands-on" involvement. The exhibit will provide direct personal experience for the user with energy concepts, energy phenomena, and the consequences of personal decision making regarding life-style and energy use.
2. An information area, which will be immediately adjacent to the exhibit area and staffed by professionally trained, knowledgeable personnel. It will disseminate pamphlets and materials on energy and conservation. This information area will pull together under a neutral, nonpartisan center information from diverse groups representing different government and private points of view and present them in a neutral, nonpartisan manner to the public. The Center will also provide on- and off-site programs and workshops on energy. These will be aimed at visitors, interested individuals and classes.

Problem Statement and Objectives

Due to the low cost and easy availability in the past of all forms of energy, and especially of electricity, most Seattle area and Washington state residents do not lead energy-efficient lives. They need an awareness of how energy is generated and of how it can be conserved. They need an understanding of the interrelatedness of the different uses of energy and of the economics of the energy system itself. Finally, in order to take the step beyond what they learn to actual change in attitudes and individual behavior, they need practical assistance on how to apply this knowledge to their own lives.

This proposal will provide a participatory approach to educational programs and information in an existing facility to alleviate the above

problems. The facility to house this Center, the Pacific Science Center, has the physical requirements of space, lecture and demonstration areas, as well as parking and central access for private and public transportation necessary to attract the public. The Pacific Science Center's reputation for success with the "hands-on" approach, its regional identification with science and technology, its existing programs and trained professional personnel, and its proven success in attracting the general public and schools to its current programs make it a favorable site for successfully and efficiently implementing this proposed Energy Center.

This proposal will answer the following questions:

1. What are the best types of exhibits involving the public in order to increase their understanding of the energy picture? to change their energy-use habits?
2. What are the best types of educational programs for a variety of age and interest groups--within the Pacific Science Center facility and as a part of its outreach programs--to increase understanding of energy resources and to change energy-use habits?

Proposal Plan

When fully underway there will be an Energy Information Center of two related parts: an exhibit area and an information area. The exhibit area will consist of informative displays and "hands-on" exhibits on specific forms of energy resources. Here the public will become informed about energy concepts, energy phenomena and the consequences of decision making with regard to lifestyle and energy use.

1. A library-display area that pulls together all available energy material from public and private sources is provided, along with assistance from knowledgeable trained staff, to the public.
2. Display material in this area will be pictorial form and exhibits of practical application of energy sources and energy-saving ideas.
3. Workshop space will be provided for related program ideas, conferences, classes and workshops. Energy-producing equipment, classes, and practical applications of learning experiences can take place in these areas.

The budget reflects both an operating program staff to develop and deliver programs to target groups, including mini exhibits, "hands-on" activities, and other tested PSC educational delivery methods, and an information center staff to organize and make available information in the Center by telephone, by person, and by mail. By this means information from a variety of sources can easily be coordinated, whether from public or from private sources.

The Energy Information Center will provide the active programs and materials to assist the public in finding ways they can save energy and

become more energy efficient in their own lives.

A carefully developed monitoring and evaluation program will provide data for improvement of the program as it is developed and tested.

This center will be in a 3000-sq. ft. area in the existing Pacific Science Center facility. The total budget for the first year and for the exhibits will be approximately \$500,000. A cost breakdown is attached.

Related Work

Energy Information Center state-of-the-art consists primarily of a passive approach to learning via dull or slick informational displays, sometimes with push-button or a programmed-learning approach. Very little has been done with the "hands-on," participatory problem-solving approach to learning of the type presented in this proposal. Furthermore, while most energy information centers do inform the public, they supply no immediate means or practical information for assisting the public in applying the knowledge gained in the exhibit areas to the practical activities and habits of everyday life. What is available along this line is generally scattered among diverse public and private agencies and businesses. It is often accompanied by policy or promotional points of view. This proposal would draw together all that is available under one neutral scientifically- and technologically-staffed center and make it available to the public. Assistance would be provided and questions would be answered by the staff.

Utilization

Successful completion of this proposal would result in:

1. An Energy and Resources Conservation Information Center in a centrally-located city (Seattle) of the Pacific Northwest Region of the country that provides energy information to residents of the area. The Center will also disseminate material on the practical application of energy resources and conservation and provide practical learning experiences to assist residents in leading more energy-efficient lives.
2. Tested approaches to exhibit materials with participant-involved learning experiences that can be applied by other centers elsewhere in the country.
3. A coordinated, central resource of all energy information and materials available to residents by a nonpartisan scientifically and technically knowledgeable staff.
4. Active, practical, experimental programs designed for the learning experiences by the public and in the schools that can be utilized by similar centers elsewhere in the country.

5. A monitoring approach to exhibits and programs that can be utilized by others.

Exhibit Area - "Energy" Budget

Note: This budget is based on development, design, and construction of an energy exhibit area with emphasis on basic energy science, an understanding of energy technology, and of the role that different energy technologies, e.g., nuclear, coal, conservation, can play in our future. Emphasis will be on the problems and solutions for the next 25 years with long-range solutions presented as future, not present, alternatives.

Staff Costs	\$150,000
Consultants, Personal Services	5,000
Materials	80,000
Contract Services	20,000
Equipment	20,000
Travel	8,000
Secretarial, Telephone, Etc.	8,000
Rent (Regional Contribution)	(N.C.)
Salary Costs	13,000
Indirect Costs	<u>50,000</u>
Total Exhibit Area Cost (Capital Cost)	\$354,000

Information Center Budget (includes workshop/school programs)

Staff Salaries	\$ 55,000
Salary Costs	5,000
Consultants, Personal Services	2,000
Materials	10,000
Equipment	55,000
Contract Services	2,000
Travel	2,000
Literature, Printing, Handouts	10,000
Rent	6,000
Indirect Salary Costs:	<u>22,500</u>
Total Information Center Cost	\$119,500